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(54) Drill bit

(57) The bit comprises a head (1) provided with cutting edges (4) and grooves (5), a shank (3) for entering in a chuck of a tool and a stem (2) intermediate the head (1) and the shank (3), the stem (2) being of reduced diameter compared with the diameter of the head (1) so that chips can escape from the head (1) unimpeded since there is no stock obstructing movement of the chips from the head (1). The cutting edges may converge to a tip and the head may have a centring point (7). The head (1) and stem (2) may be integral with or connectable to the shank (3).

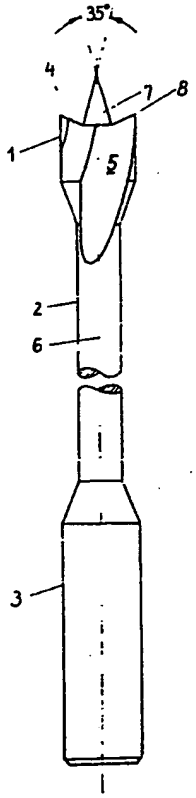

Fig 1

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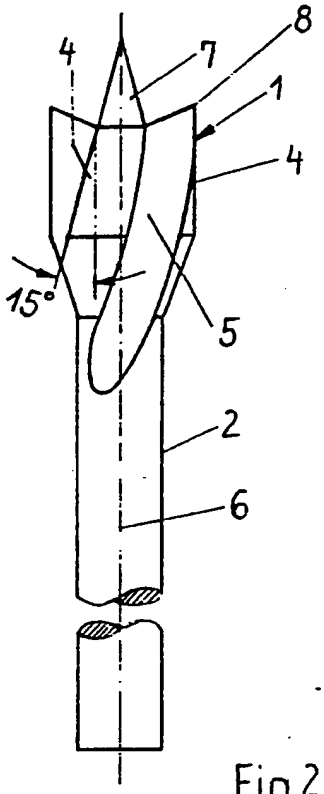

Fig.2

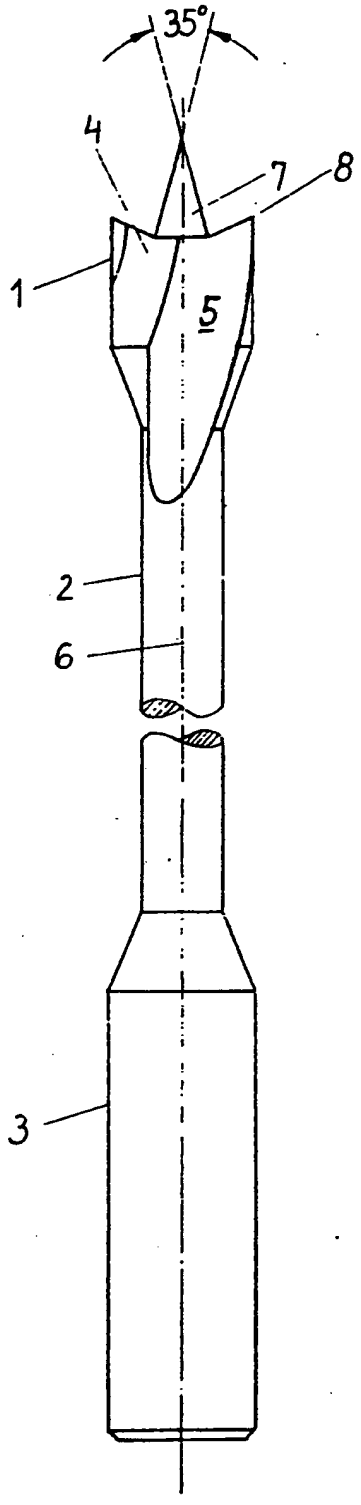

Fig.1

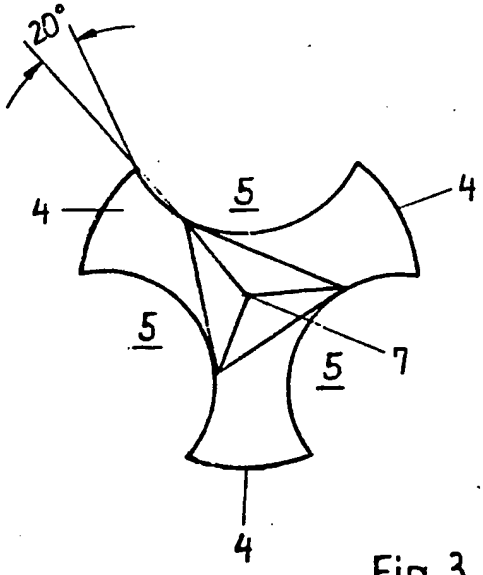

Fig.3

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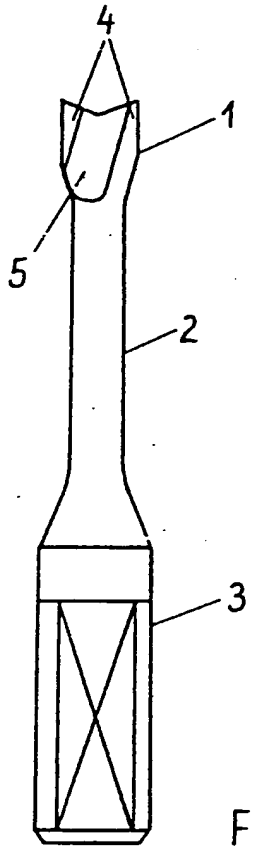

Fig.5

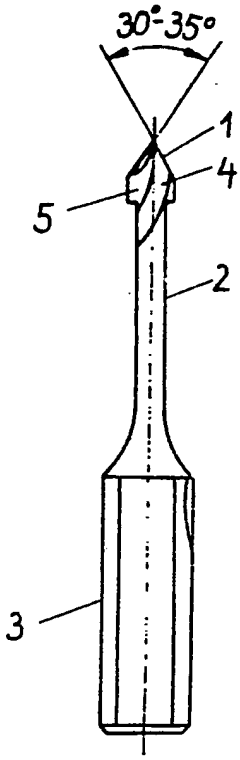

Fig.4

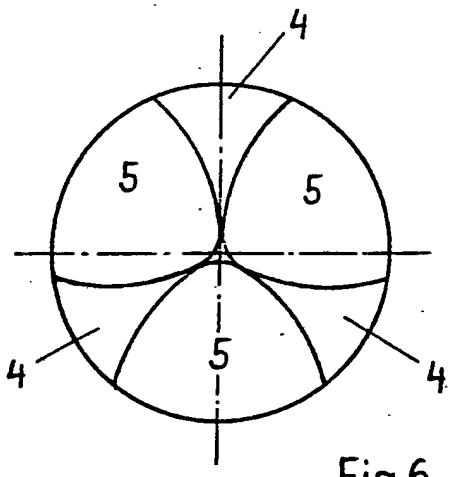

Fig.6

A Drill

The invention relates to a drill.

For the drilling of dowel holes in wood or plastics, drills are known which consist of a shank, a base body and a hard metal drillhead brazed onto the base body and having cutting edges which form the drillhead.

The known drills have the disadvantage of high manufacturing costs, which is to be attributed in particular to the brazing on of the hard metal drillhead. Furthermore the strength of the brazed-on drillhead to resist torsion is restricted. For this reason their tool life is often relatively short, for they may snap or shear off even regularly. This applies in particular when used in automatic dowel drilling machines handling chip-board where operation is at very high rates of feed. In addition to that because of the high rate of feed no time is left for the chips to "climb up" spirally in the long chip grooves. The chips on the contrary spray upwards perpendicularly to the material and thereby represent an additional loading for the drill. Furthermore the guidance properties of the drill and the quality of the hole suffer from that.

The problem underlying the present invention is therefore to create a drill of the kind mentioned initially, which has a longer tool life and which in particular is better suited to use in automatic dowel drilling machines.

In accordance with the invention this problem is solved by a

drillhead having cutting edges formed in it, the drillhead being in one place with the base body which succeeds it to form the drill stem, the outer diameter or outer perimeter of the drill stem being distinctly smaller than the drillhead.

Through the construction of the drillhead, in accordance with the invention, from stock which according to the loading consists of a high-grade material, the tool life is distinctly prolonged, for in comparison with brazed-on hard-metal plates or drillheads snapping or shearing off is avoided. By the drill stem following the drillhead with an appropriately reduced diameter, there is sufficient room for leading away the chips, whereby the guidance properties of the drill in accordance with the invention and the quality of the hole produced by it are distinctly improved. The slightly higher raw materials costs for the construction of a drillhead completely of high-grade material are compensated by the saving of material in the region of the drill stem.

The drill in accordance with the invention is preferably suited with the greatest success to automatic dowel drilling machines for chipboard with or without plastics cladding, for medium-dense fibreboard (MDF) and other stock which is difficult or very difficult to machine.

Through the drill stem being ground smooth to its reduced diameter the chips can escape upwards unimpeded perpendicularly to the material being machined, since now there is no longer any supporting material standing obstructively in the way.

This also means that in a further refinement of the invention chip grooves are formed only in the drillhead and

that the drill stem exhibits a smooth outer diameter.

In this way the production of the drill in accordance with the invention is further simplified.

A not obvious but inventive further development of the invention consists in the drillhead being provided with three cutting edges.

In the case of known drills the cutting-edge loading with the usual twin-cutting-edge dowel drills amounts to 50% each. Through the additional construction of a third cutting edge on the drillhead which now becomes possible through its refinement in accordance with the invention, the loading per cutting edge is reduced to 33%. In this way a still better tool life of the drill results. It has moreover been established that in comparision with the usual two cutting edges the drill in accordance with the invention also has distincly better guidance properties, whereby the risk arising in the case of known drills of breaking out at the edges is largely avoided.

Furthermore through the three cutting edges and the thereby distributed cutting force, drilling into the material is facilitated and the quality of the hole in the material is additionally improved.

The drillhead, the drill stem and the shank will advantageously be produced in one piece, whereby its production is distinctly simplified. For achieving adequate hardness of material for the drill many different materials and methods of production are known in principle. Thus, e.g., as raw material HSS material may be employed, which is subsequently enriched through a TiN or TiC layer by the physical or chemical surface coating process so that the

consequence is an improvement in the cutting quality and the tool life.

But through a technical innovation of the physical surface coating process known hitherto it is possible by the plasma process to vaporize diamond or diamond-like layer onto the cutting part of the drill. The outcome from drill and C layer is a completely new quality of drill with a completely new tool life which is longer than that of the hard metal.

But the drillhead and the drill stem may equally well consist of one piece of high-grade material which subsequently is connected to a shank. In this case the drillhead and the drill stem may be manufactured from hard-metal material.

The connection of the drill stem to the shank may in that case be detachable or solid. A solid connection may be affected by, e..g., brazing the drill stem into the shank.

A detachable connection has the advantage that a number of drills of different diameters or different kinds may be combined with one single shank and in this way shanks may be saved.

The detachable connection between the drill stem and the shank may be effected in various ways. Combinations of that kind are already basically known. Possible examples of this are: Taper or thread connections between the shank and the drill stem, a bayonet joint or a connection with a groove with a circlip and an area as driver.

The drill head in accordance with the invention may be provided with or without an auxiliary or centreing tip. Again, the drill may obviously be made with a righthand or

lefthand cut.

In a further refinement of the invention it may be provided that the drillhead is provided with cutting edges which form a roof shape. This form is suitable in particular for holes drilled right through.

In a further development of the invention it may be provided that the drillhead is provided with cutting edges standing up, with the chip grooves leaving from the central region of the drillhead.

The sensitivity (snapping off) of the roughing cutters usual hitherto, in the case of particularly hard material (coated chipboard) is thereby avoided.

In further development of the invention it may moreover be provided that the chip grooves run at an angle descending towards the drill tip, which deviates from the angle of twist, the centreing tip being wholly omitted.

In this way a considerable drop in the cutting force is achieved and thereby longer durability of the cutting edges and better cutting by the drill since a negative effect of the cross-cutting edge of the centreing tip is removed.

Embodiments of the invention are described below in principle with the aid of the drawing.

There is shown in:

Figure 1 - a side elevation of the drill in accordance with the invention;

Figure 2 - the second side elevation of the drill according

to Figure 1;

Figure 3 - an elevation of the drillhead in accordance with Figures 1 and 2 from the front on a larger scale;

Figure 4 - a side elevation of a drill in accordance with the invention with a tip in the shape of a roof;

Figure 5 - a drill in accordance with the invention in side elevation without a centreing tip; and

Figure 6 - an elevation of the drill according to Figure 5, of the drillhead on a larger scale.

The drill in accordance with Figure 1 with a coating forms as drill and coating one unit.

The drill in accordance with the invention exhibits a drillhead 1, a drill stem 2 connected to it and a shank 3 for chucking the drill. All three parts are in one piece; i.e., they consist of the same material. But obviously the shank may also consist of another material and be connected detachably or solidly to the drill stem 2.

As may be seen, the drill stem 2 exhibits with respect to the drillhead 1 and the shank 3 a distinctly reduced diameter, whilst for reasons of rigidity and for satisfactory leading away of the chips the transition in each case is made tapered.

In the case of a drill for drilling holes of a diameter of 5 mm the diameter of the drill stem 2 may amount to between 3.0 and 3.5 mm. The length of the drillhead 1 may amount to between 3 and 7 mm, preferably between 4 and 5 mm.

In general the drill in accordance with the invention will be used in a range of diameters from 4 to 12 mm, though obviously in case of need deviations upwards and downwards are also possible.

It may be seen very clearly from Figure 3 the drillhead 1 exhibits three cutting edges 4 uniformly distributed round the circumference, which have a spacing of 120 degrees from one another. Between the cutting edges 4 chip grooves 5 are formed which exhibit a radius and with respect to the longitudinal axis 6 of the drill have an angle of 15 degrees, the chip grooves 5 running in addition slightly in the shape of an arc. In the case of a drill which cuts righthanded, the angle of the chip groove in the drawing slopes towards the left against the direction of rotation. In the case of a drill cutting lefthanded the direction of the angle is obviously reversed.

The drill respesented in Figures 1 to 3 exhibits an auxiliary or centreing tip 7 which projects a few millimetres above the front edges of the cutting edges 4. In the case of a drill for drilled holes of 5 mm diameter the length of the centreing tip may amount to between 3 and 4 mm. Just like the chip grooves 5 the cutting edges 4 are obviously slightly curved in the shape of an arc too, the shape of the arc running towards the rear from the top downwards according to the direction of rotation. A cutting edge 8 standing up effects a prescratching of the panel and thereby acts like the already known rough cutter.

In Figure 4 a drill is represented which basically is of the same construction as that represented in Figures 1 to 3. The sole difference consists merely in that the drillhead 1 is provided with three cutting edges 4 which taper upwards or respectively forwards into a tip in the shape of a roof;

i.e., they converge onto the longitudinal axis of the drill. In this case there are likewise three cutting edges and these are in one piece with the drillhead 1 which again is in one piece with the drill stem 2 and the shank 3. A drill of this kind may be employed particularly advantageously for drilling right through.

In Figures 5 and 6 a third embodiment of the drill is represented. Here too the drillhead 1, the drill stem 2 and the shank 3 consist again of the same material, though obviously here too the shank 3 may in case of need consist of another material and may be connected detachably or rigidly to the drill stem.

The sole difference as compared with the embodiment according to Figures 1 to 3 consists in there being no centreing tip. Instead of a centreing tip the cutting edges 4 are made standing up (see Figure 5), the three chip spaces or chip grooves 5 being for this purpose "ground together" into the drillhead 1 in such a way that the centreing tip may thereby be omitted and the cutting forced reduced.

In that case the chip grooves run on a rise towards the rear and have an angle which drops towards the tip and which is not identical with the twist angle, i.e., the angle of twist of the spiral chip grooves.

CLAIMS

1. A drill comprising a head, a shank and an intermediate portion between the head and the shank wherein the intermediate portion is a reduced transverse dimension compared with the head.

2. A drill as claimed in Claim 1, wherein the head is provided with grooves.

3. A drill as claimed in Claim 1 or 2, wherein the drill is provided with three cutting edges.

4. A drill as claimed in Claim 3 wherein the cutting edges are arranged at 120 degrees relative one to another circumferentially of the head.

5. A drill as claimed in any one of the preceding Claims wherein the head, the shank and the intermediate portion are integral.

6. A drill as claimed in Claim 5 wherein the head, the shank and the intermediate portion consist of HSS material, the head being provided with a coating to lengthen its tool life.

7. A drill as claimed in any one of Claims 1 to 4 wherein the head and the intermediate portion cosnsist of a hard metal material and together as a unit are connected to the shank.

8. A drill as claimed in Claim 7 wherein the head and the intermediate portion are connected detachably to the shank.

9. A drill as claimed in any one of Claims 1 to 8 wherein the head is provided with cutting edges which converge.

10. A drill as claimed in any one of Claims 1 to 8 wherein the head is provided with cutting edges which form a recess and grooves are provided extending outwardly from a central region of the head.

11. A drill as claimed in Claim 10 wherein the grooves extend at an angle towards a drill tip, which angle deviates from an angle of twist.

12. A drill as claimed in any one of Claims 1 to 8 wherein the head is provided with a centreing tip.

13. A drill substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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